

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Please amend the claims as follows:

1. (Currently Amended) A method of processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said method comprising:

receiving in an aggregation device said plurality of keep-alive messages;

generating in said aggregation device an aggregated request packet which includes data indicating that the status of said PPP sessions is requested; ~~and~~

sending said aggregated request packet to a peer aggregation device;

receiving an aggregated reply packet from the peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint; and

sending a proxy keep-alive reply message to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

2. (Currently Amended) The method of claim1, further comprising:

receiving said aggregated request packet in said peer aggregation device;

indicating the status of said plurality of sessions in ~~an~~ the aggregated reply packet; and

sending said aggregated reply packet to said aggregation device.

3 - 4. (Cancelled)

5. (Currently Amended) The method of ~~claim 4~~ claim 1, further comprising:  
maintaining a ~~remote~~ the local status table in said aggregation device, wherein said ~~remote local~~ status table indicates the status of sessions supported by said aggregation device;  
updating said ~~remote local~~ status table with the information in said aggregated reply packet; and  
generating said proxy keep-alive reply according to said ~~remote local~~ status table.

6. (Original) The method of claim 5, wherein said proxy keep-alive message indicates that the corresponding session is alive/OK when a first keep-alive message is received for the corresponding session.

7. (Original) The method of claim 6, further comprising initializing the status of each of said session to alive/OK such that said proxy keep-alive message in response to said first keep-alive message indicates alive/OK status.

8. (Original) The method of claim 1, wherein said communication network is implemented using one of frame relay, ATM and IP networks.

9. (Original) The method of claim 1, wherein said aggregation device is one of a network access server and home gateway.

10. (Currently Amended) A method of processing an aggregated request packet in an aggregation device, wherein said aggregated request packet is received from a peer aggregation device and indicates that the status of a plurality of point-to-point sessions is requested, said method comprising:

examining said aggregated request packet to determine that the status of said plurality of point-to-point sessions is requested;

determining the status of each of said plurality of point-to-point sessions;

generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; ~~and~~

sending said aggregated reply packet to said peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a remote status table is updated with the status of the PPP sessions, which have the peer aggregation device as an endpoint, and wherein a proxy keep-alive reply message is sent to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

11. (Cancelled)

12. (Original) The method of claim 10, wherein said generating comprises including a client magic number associated with each of said plurality of point-to-point sessions.

13. (Original) The method of claim 10, wherein said generating comprises setting a bit to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

14. (Original) The method of claim 10, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

15. (Currently Amended) An aggregation device for processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said aggregation device comprising:

an input interface receiving said plurality of keep-alive messages;

a message aggregator coupled to said input interface, said message aggregator examining said plurality of messages and generating data according to a format indicating that the status of said PPP sessions is requested; and

an output interface sending an aggregated request packet on said communication network to a peer aggregation device, said aggregated request packet containing said data generated by said message aggregator, wherein the aggregation device is further configured to receive an aggregated reply packet from the peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint, and wherein a proxy keep-alive reply message is sent to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

16. (Original) The aggregation device of claim 15, further comprising an encapsulator encapsulating said data in a packet suitable for transmission on said communication network.

17. (Currently Amended) The aggregation device of claim 16, further comprising:  
~~a remote status table indicating the status of sessions supported by said aggregation device; and~~

a de-aggregator ~~receiving an~~ configured to receive the aggregated reply packet from said peer aggregation device, wherein said aggregated reply packet indicates the status of at least some of said plurality of PPP sessions, said de-aggregator updating said remote status table with the information in said aggregated reply packet.

18. (Currently Amended) The aggregation device of claim 17, further comprising a proxy reply unit sending ~~a~~ the proxy keep-alive reply message to one of said plurality of end systems originating a corresponding one of said keep alive-messages without waiting for said aggregated reply packet.

19. (Currently Amended) The ~~invention~~ aggregation device of claim 18, wherein said aggregation device comprises a network access server.

20. (Original) The aggregation device of claim 18, wherein said aggregated request packet contains a magic number related to each of the corresponding sessions.

21. (Currently Amended) An aggregation device for processing a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, said aggregation device comprising:

~~first~~ means for receiving said plurality of keep-alive messages;

means for generating an aggregated request packet which includes data indicating that the status of said PPP sessions is requested; ~~and~~

means for sending said aggregated request packet to a peer aggregation device;

means for receiving an aggregated reply packet from the peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint; and

means for sending a proxy keep-alive reply message to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

22 - 24. (Cancelled)

25. (Currently Amended) An aggregation device for processing an aggregated request packet, wherein said aggregated request packet is received from a peer aggregation device and indicates that the status of a plurality of point-to-point sessions are requested, said aggregation device comprising:

means for examining said aggregated request packet to determine that the status of said plurality of point-to-point sessions is requested;

means for determining the status of each of said plurality of point-to-point sessions;

means for generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; ~~and~~

means for sending said aggregated reply packet to said peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a remote status table is updated with the status of the PPP sessions, which have the peer aggregation device as an endpoint, and wherein a proxy keep-alive reply message is sent to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

26. (Cancelled)

27. (Original) The aggregation device of claim 25, wherein said means for generating includes a client magic number associated with each of said plurality of point-to-point sessions.



28. (Original) The aggregation device of claim 25, wherein said means for generating sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

29. (Original) The aggregation device of claim 25, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

30. (Currently Amended) An aggregation device for processing an aggregated request packet, wherein said aggregated request packet is received from a peer aggregation device and indicates that the status of a plurality of point-to-point sessions are requested, said aggregation device comprising:

an input interface receiving said aggregated request packet;

a de-encapsulator examining said aggregated request packet to determine that the status of said plurality of point-to-point sessions is requested;

a reply generator determining the status of each of said plurality of point-to-point sessions, and generating an aggregated reply packet indicating the status of each of said plurality of point-to-point sessions; and

an output interface sending said aggregated reply packet to said peer aggregation device, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint, and wherein a proxy keep-alive reply message is sent to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received..

31. (Cancelled)

32. (Currently Amended) The aggregation device of ~~claim 31~~ claim 30, further comprising a session manager updating the status of said plurality of point-to-point sessions in said local status table.

33. (Original) The aggregation device of claim 30, wherein said reply generator includes in said aggregated reply packet a client magic number associated with each of said plurality of point-to-point sessions.

34. (Original) The aggregation device of claim 30, wherein said reply generator sets a bit in said aggregated reply packet to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

35. (Original) The aggregation device of claim 30, further comprising a keep-alive processor coupled to said de-encapsulator, wherein said keep-alive processor examines said aggregated request packet to determine that status of point-to-point sessions is requested and causes said reply generator to generate said aggregated reply packet.

36. (Original) The aggregation device of claim 30, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

37. (Currently Amended) A computer-readable medium carrying one or more sequences of instructions for causing a aggregation device to process a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on a communication network, wherein execution of said one or more sequences of instructions by one or more processors contained in said aggregation device causes said one or more processors to perform the actions of:

receiving in an aggregation device said plurality of keep-alive messages;

generating in said aggregation device an aggregated request packet which includes data indicating that the status of said PPP sessions is requested; and

sending said aggregated request packet to a peer aggregation device;

receiving an aggregated reply packet from the peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint; and

sending a proxy keep-alive reply message to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

38 - 40. (Cancelled)

41. (Currently amended) The computer-readable medium of ~~claim 40~~ claim 37, further comprising:

~~maintaining a remote status table in said aggregation device, wherein said remote status table indicates the status of sessions supported by said aggregation device;~~

updating said remote status table with the information in said aggregated reply packet;  
and generating said proxy keep-alive reply according to said remote status table.

42. (Currently Amended) A computer-readable medium carrying one or more sequences of instructions for causing an aggregation device to process an aggregated request packet, wherein said aggregated request packet is received from a peer aggregation device and indicates that the status of a plurality of point-to-point sessions are requested, wherein execution of said one or more sequences of instructions by one or more processors contained in said aggregation device causes said one or more processors to perform the actions of:

examining said aggregated request packet to determine that the status of said plurality of point-to-point sessions is requested;

determining the status of each of said plurality of point-to-point sessions;

generating an aggregated reply packet indicating the status of said plurality of point-to-point sessions; ~~and~~

sending said aggregated reply packet to said peer aggregation device;

receiving an aggregated reply packet from the peer aggregation device, wherein the aggregated reply packet indicates the status of at least some of the plurality of PPP sessions, wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint; and

sending a proxy keep-alive reply message to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received.

43. (Cancelled)

44. (Original) The computer-readable medium of claim 42, wherein said generating comprises including a client magic number associated with each of said plurality of point-to-point sessions.

45. (Original) The computer-readable medium of claim 42, wherein said generating comprises setting a bit to one logical value to indicate that a corresponding one of said plurality of sessions is OK/alive, and to another logical value to indicate that said corresponding one of said plurality of session not OK/alive.

46. (Original) The computer-readable medium of claim 42, wherein said aggregation device comprises one of a network access server (NAS) and a home gateway implemented in a communication network.

47. (Currently Amended) A communication network comprising:

a first aggregation device receiving a plurality of keep-alive messages generated by a corresponding plurality of end systems, each of said plurality of keep-alive messages being designed to request the status of a corresponding point to point (PPP) session implemented on said communication network, said first aggregation device generating an aggregated request packet which includes data indicating that the status of said PPP sessions is requested, and sending said aggregated request packet; and

a peer aggregation device receiving said aggregated request packet and indicating the status of said plurality of sessions in an aggregated reply packet, said peer aggregation packet sending said aggregated reply packet to said first aggregation device, **wherein content of a local status table is updated with the status of the PPP sessions, which have the aggregation device as an endpoint, and wherein a proxy keep-alive reply message is sent to one of the plurality of end systems originating a corresponding one of the keep alive-messages without waiting for the aggregated reply packet to be received**

~~wherein each of said first aggregation device and said peer aggregation device is implemented as a single device.~~

48. (Previously Presented) The communication network of claim 47, wherein said first aggregation device is located at an edge of said communication networks.

49. (Previously Presented) The communication network of claim 48, further comprising an access network coupling said first aggregation device to said corresponding plurality of end systems, wherein said plurality of keep-alive messages are received on said access network.



50. (Previously Presented) The communication network of claim 49, wherein said first aggregation device and said peer aggregation device respectively comprise a network access server (NAS); and a home gateway.

51 - 58. (Cancelled)

59. (Previously Presented) The method of claim 1, wherein said aggregation device is physically separate from said plurality of end systems.

60. (Previously Presented) The method of claim 10, wherein said aggregation device is physically separate from said plurality of end systems.

61 - 66. (Cancelled)

67. (Previously Presented) The method of claim 1, wherein said generating includes less data in said aggregated request packet than the data forming said plurality of keep-alive messages together.

68. (Previously Presented) The method of claim 67, wherein each of said plurality of keep-alive messages contains an identifier of a corresponding PPP session, wherein said generating comprises:

selecting said identifier of each of said plurality of keep-alive messages; and

forming said aggregated request packet from said identifiers,

whereby said aggregated request packet contains less data than said plurality of keep-alive messages together.

69. (Previously Presented) The method of claim 1, wherein each of said PPP sessions terminates at a home gateway, and wherein said aggregation device comprises a switching device and is in the path of each of said PPP sessions from a corresponding one of said plurality of end systems to said home gateway.

70. (Previously Presented) The aggregation device of claim 30, wherein said reply generator includes less data in said aggregated request packet than the data forming said plurality of keep-alive messages together.

71. (Previously Presented) The aggregation device of claim 70, wherein each of said plurality of keep-alive messages contains an identifier of a corresponding PPP session, wherein said reply generator operates to:

- select said identifier of each of said plurality of keep-alive messages; and
- form said aggregated request packet from said identifiers,

whereby said aggregated request packet contains less data than said plurality of keep-alive messages together.

72. (Previously Presented) The aggregation device of claim 30, wherein each of said PPP sessions terminates at a home gateway, and wherein said aggregation device comprises a switching device and is in the path of each of said PPP sessions from a corresponding one of said plurality of end systems to said home gateway.

73. (Previously Presented) The computer-readable medium of claim 37, wherein said generating includes less data in said aggregated request packet than the data forming said plurality of keep-alive messages together.

74. (Previously Presented) The computer readable medium of claim 73, wherein each of said plurality of keep-alive messages contains an identifier of a corresponding PPP session, wherein said generating comprises:

- selecting said identifier of each of said plurality of keep-alive messages; and
- forming said aggregated request packet from said identifiers,
- whereby said aggregated request packet contains less data than said plurality of keep-alive messages together.

75. (Previously Presented) The computer-readable medium of claim 37, wherein each of said PPP sessions terminates at a home gateway, and wherein said aggregation device comprises a switching device and is in the path of each of said PPP sessions from a corresponding one of said plurality of end systems to said home gateway.

76. (Previously Presented) The aggregation device of claim 21, wherein said means for generating includes less data in said aggregated request packet than the data forming said plurality of keep-alive messages together.

77. (Previously Presented) The aggregation device of claim 76 wherein each of said plurality of keep-alive messages contains an identifier of a corresponding PPP session, wherein said means for generating operates to:

- select said identifier of each of said plurality of keep-alive messages; and

form said aggregated request packet from said identifiers,  
whereby said aggregated request packet contains less data than said plurality of keep-alive messages together.

78. (Previously Presented) The aggregation device of claim 21, wherein each of said PPP sessions terminates at a home gateway, and wherein said aggregation device comprises a switching device and is in the path of each of said PPP sessions from a corresponding one of said plurality of end systems to said home gateway.

79. (Previously Presented) The method of claim 1, wherein said receiving, said generating and said sending are performed in an aggregation device implemented as a single device.

80. (Previously Presented) The method of claim 10, wherein said examining, said determining, said generating and said sending are performed in said aggregation device implemented as a single device.

81. (Previously Presented) The aggregation device of claim 21, wherein said means for receiving, said means for generating and said means for sending are contained in said aggregation device implemented as a single device.

82. (Previously Presented) The aggregation device of claim 25, wherein said means for examining, said means for determining, said means for generating and said means for sending are implemented in said aggregation device implemented as a single device.

83. (Previously Presented) The aggregation device of claim 30, wherein said input interface, said de-encapsulator, said reply generator and said output interface are contained in said aggregation device implemented as a single device.

84. (Previously Presented) The computer readable medium of claim 37, wherein said receiving, said generating and said sending are performed by said aggregation device implemented as a single device.

85. (Previously Presented) The computer readable medium of claim 42, wherein said examining, said determining, said generating and said sending are performed by said aggregation device implemented as a single device.